DANFYSIK

Ultrastab 866 Precision Current Transducer
User Manual

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The *ULTRASTAB 866 Current Transducer* is the latest model in the DANFYSIK Current Transducer program. It is the first transducer of its class with transducer head and SMD based electronics integrated in one assembly.

The model *866* is based on the proven high performance current measurement system in the *ULTRASTAB* program, and it is used as a current feed back element in precision power supplies or gradient amplifiers.

It ranges 0-600A from DC to 100 kHz with a temperature coefficient lower than 1 ppm/°C. Powered with ±15V it produces an analog current of 400mA at 600 A primary current.

Output noise and noise feed back to the main conductor are both extremely low, and electrostatic shielding ensures maximum immunity against external electrostatic fields.

THE *866* FEATURES

* Bandwidth DC to 100 kHz
* Linearity better than 1 ppm
* Absolute calibration traceable to NIST
* Temperature coefficient less than
* 0.3 ppm/°C
* Resolution better than 0.05 ppm
* Bipolar, up to 400mA output current at
* 600A primary current
* Low noise on the output signal
* Noise feed back to main conductor < 10µV

APPLICATIONS:

* Feed back element in high performance gradient amplifiers
* Feed back element in precision current regulated power supplies

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WORKING PRINCIPLE:

The DANFYSIK *ULTRASTAB 866 Current Transducer* system is a unique design, based on the zero-flux principle for galvanically isolated current measurement.

With the primary current conductor through the transducer head center hole and current flowing, the electronics will generate a current in the built-in compensation winding counter-balancing the primary ampere turns.

A very sensitive and extremely low noise detector circuit (patented) will detect when zero-flux is obtained, and an analog current signal will be generated at the output terminals in direct proportion to the primary current.

INSTALLATION:

The *ULTRASTAB 866* unit is fully self-contained, requiring only ±15V voltage supply.
All connections via a 9-pole D-SUB socket.

It can be installed in any orientation and has a high immunity to external magnetic and electrostatic fields.

With the *866* delivered with the standard current transfer ratio of 1500:1, a 600A primary current will generate a 400mA compensation current. Wired up with a 2.5 Ohm Burden resistor, a 1V analog output signal will be available.

If e.g. a max. 450A primary current shall be measured, the Burden resistor can be increased to 3.3 Ohm producing a 1V analog signal. From Fig. 1 on the attached installation data sheet it

can be seen that the *866* can operate with higher resistance values of Burden resistors, but in order to get the best performance out of the Burden resistors, we recommend to keep the power loss as low as possible.

STANDARD FEATURES:

The *ULTRASTAB 866* is equipped with opto isolator for status interlock reading.

The *ULTRASTAB 866* has a built-in scanning lock in circuit for automatic recovery to normal operation after overload condition.

OPTIONAL FEATURES:

The *ULTRASTAB 866* has a built-in free-running oscillator, which drives the zero flux detector circuitry.

In cases where the application requires synchronization with external oscillator frequencies, e.g. in gradient amplifiers, the *866* can be delivered with a fibre optics trigger input for the frequency range 35 to 45 kHz.

ACCESSORIES:

* Mounting bracket
* 9-pole D-sub with 2 m shielded cable
* 2.5 Ohm Burden resistor (4 x 10 Ohm //), 0.1%, T_c < 3 ppm/°C.
* ø25 busbar

ORDERING INFORMATION
STANDARD:

* *866* current transducer
* *866*-BR 2.5 Burden resistor
* *866*-BR 5.0 Burden resistor
* *866*-SC, 2m shielded cable
* *866*-BB, busbar
* *866*-MB, mounting bracket

OPTIONAL:
* *866*-FIB, fibre optics trigger input

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ULTRASTAB 866-150 CURRENT TRANSDUCER

BASIC SPECIFICATIONS	
Primary current I (max.)	0-150A
Polarity	Bipolar
Output current (max.)	0-200 mA
Overload capacity: Normal operation Basic function maintained Fault	 100% 110% 500% (0.1 s.)
External Burden resistor - see fig. 1: Max. Min.	 100 ? 5 ?
Current transfer ratio	750:1
Linearity	< 1 ppm
Measuring/ratio stability: Initial v.s. temperature v.s. time	 < 2 ppm < 0.3 ppm/ °C < 1 ppm/month
Offset: Initial v.s. temperature	 8 µA 0.1 µA/°C
Output noise (RMS): DC - 10 Hz DC - 10 kHz DC - 50 kHz	 < 0.04 µA < 2.4 µA < 8 µA
Feedback noise (RMS), DC - 50 kHz (measured on the primary current cable – one turn)	< 10 µV (typical 5 µV)
Busbar free zone (from center)	r = 70 mm

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ULTRASTAB 866-150 CURRENT TRANSDUCER

BASIC SPECIFICATIONS	
Slew rate (10-90%)	> 10 kA/ms
Bandwidth (3 dB, small signal 0.5%)	DC to 100 kHz
Test voltage (pin 4 - ground to a ø25 busbar)	5 kV AC (RMS)
Operating temperature	10 – 50°C
Input power requirement	Max. power consumption 5 VA ±15 V regulated < ±5% 200 mA + compensation current
Mechanical dimensions 866 assembly: Weight	122 x 98 x 57 mm hole for busbar or cable: φ 26 mm approx. 1 kg
Optional feature: Input for 35-45 kHz oscillator trigger signal via fibre optics (HP-HFBR2521).	

All ppm figures refer to max. output.
Specifications are subject to change without notice.

We recommend that a shielded output cable and plug are used to ensure the maximum immunity against electrostatic fields.

9-pole D-SUB

Pin configuration:	Pin 1	(For factory use only)
	Pin 2	(Test pin for zero detector - factory use only)
	Pin 3	Normal operation status - opto coupler -
	Pin 4	GND and electrostatic shield
	Pin 5	-15 V / 50mA + compensation current
	Pin 6	Current output
	Pin 7	(For factory use only)
	Pin 8	Normal operation - opto coupler +
	Pin 9	+15 V /200 mA + compensation current

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ULTRASTAB 866-600 CURRENT TRANSDUCER

BASIC SPECIFICATIONS	
Primary current I (max.)	0-600A
Polarity	Bipolar
Output current (max.)	0-400 mA
Overload capacity: Normal operation Basic function maintained Fault	 100% 110% 500% (0.1 s.)
External Burden resistor - see fig. 1: Max. Min.	 100 ? 2.5 ?
Current transfer ratio	1500:1
Linearity	< 1 ppm
Measuring/ratio stability: Initial v.s. temperature v.s. time	 < 2 ppm < 0.3 ppm/°C (0.120 µA) < 1 ppm/month (0.060 µA)
Offset: Initial v.s. temperature	 < 20 ppm (8 µA) < 0.2 ppm (0.1 µA/°C)
Sensivity to power supply changes	< 1.5 ppm/%
Output noise (RMS): DC - 10 Hz DC - 10 kHz DC - 50 kHz	 <0.05 ppm (0.02 µA) <3 ppm (1.2 µA) <10 ppm (4 µA)
Feedback noise (RMS), DC - 50 kHz (measured on primary cable – one turn)	< 10 µV (typical 5 µV)
Busbar free zone to be within linearity specification: Cylinder shape (diameter x length)	 Ø 150 x 150 mm

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ULTRASTAB 866-600 CURRENT TRANSDUCER

BASIC SPECIFICATIONS	
Slew rate (10-90%)	> 10 kA/ms
Bandwidth (3 dB, small signal 0.5%)	DC to 100 kHz
Test voltage (pin 4 - ground to a ø25 busbar)	5 kV AC (RMS)
Operating temperature Storage temperature	10 – 50°C 0 – 60°C
Input power requirement	Max. power consumption 10 VA ±15 V regulated < ±5% 200 mA + compensation current
Emission complying standard Immunity complying standard	EN 50081-2 EN 50082-2-1995
Operating humidity	20 – 80%
Mechanical dimensions 866 assembly: Weight	122 x 98 x 57 mm hole for busbar or cable: φ 26 mm approx. 1 kg
Optional feature: Input for 35-45 kHz oscillator trigger signal via fibre optics (HP-HFBR2521).	

All ppm figures refer to max. output.
Specifications are subject to change without notice.

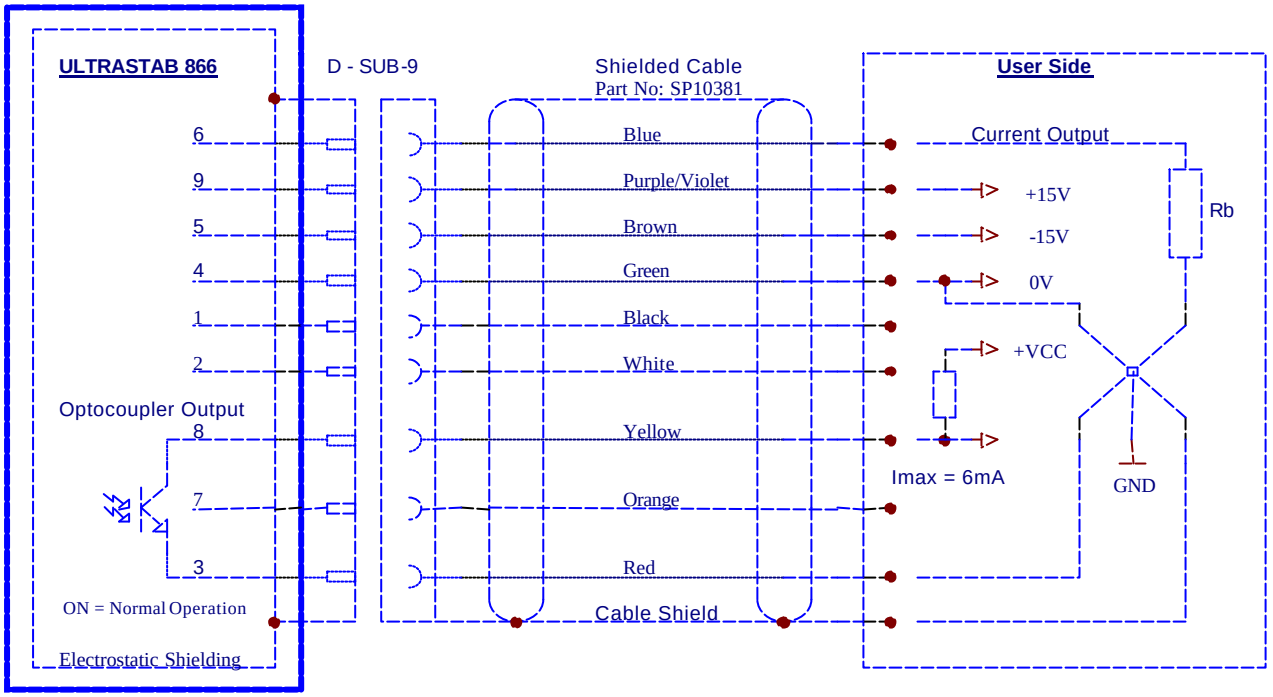
We recommend that a shielded output cable and plug are used to ensure the maximum immunity against electrostatic fields.

9-pole D-SUB

Pin configuration:	Pin 1	(For factory use only)
	Pin 2	(Test pin for zero detector - factory use only)
	Pin 3	Normal operation status - opto coupler -
	Pin 4	GND
	Pin 5	-15 V
	Pin 6	Current output
	Pin 7	(For factory use only)
	Pin 8	Normal operation - opto coupler +
	Pin 9	+15 V
	House	Electrostatic shield

VOM-Voltage Output Module

SPECIFICATIONS	
Slew rate (10-90%)	600A
Output voltage:	Bipolar ± 10V
Offset Initial: vs. temperature:	 < 10 ppm <5 ppm
Gain Initial: vs. temperature:	 < 50 ppm < 6ppm /°C
Linearity:	< 50 ppm
Bandwidth: (3dB)	DC-100kHz

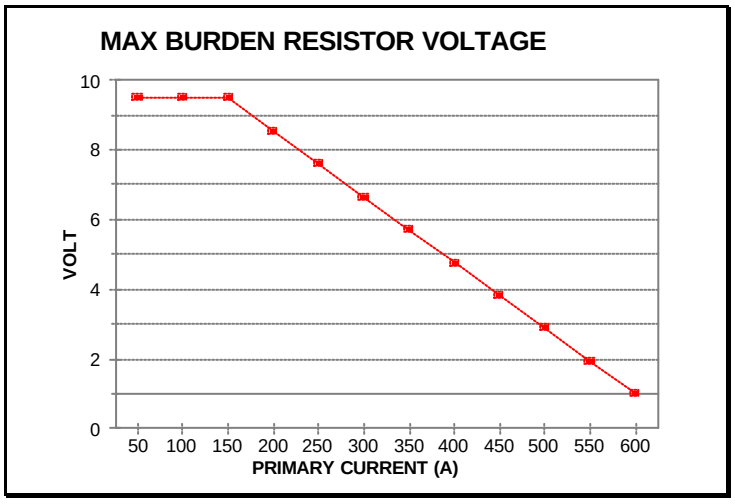


The Wiring diagram shows:

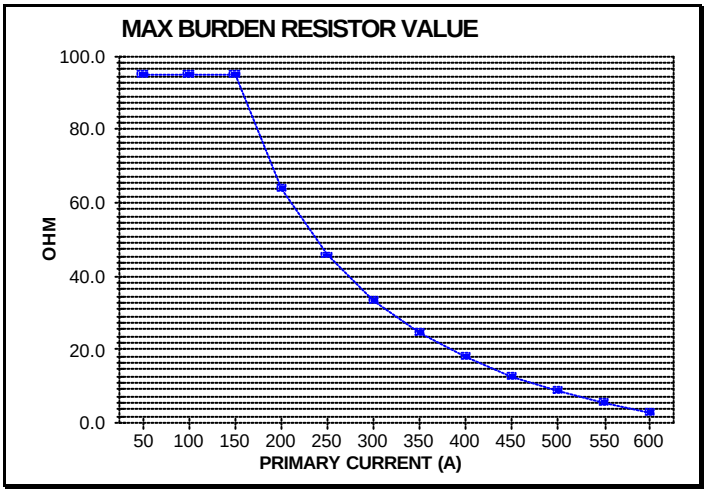
- Power connections
- Connection of Burden Resistor (Rb)
- Connection of opto-coupler output (status)

Re. Status: Normal Operation means:

- +/- 15V present
- Zero detectors are working.
- Output Current < 110%.



The graph shows the maximum Voltage that can Be achieved across the externally connected Burden Resistor as a function of the Primary Current.



The Graph shows the relationship between the Burden Resistor and the Primary Current.

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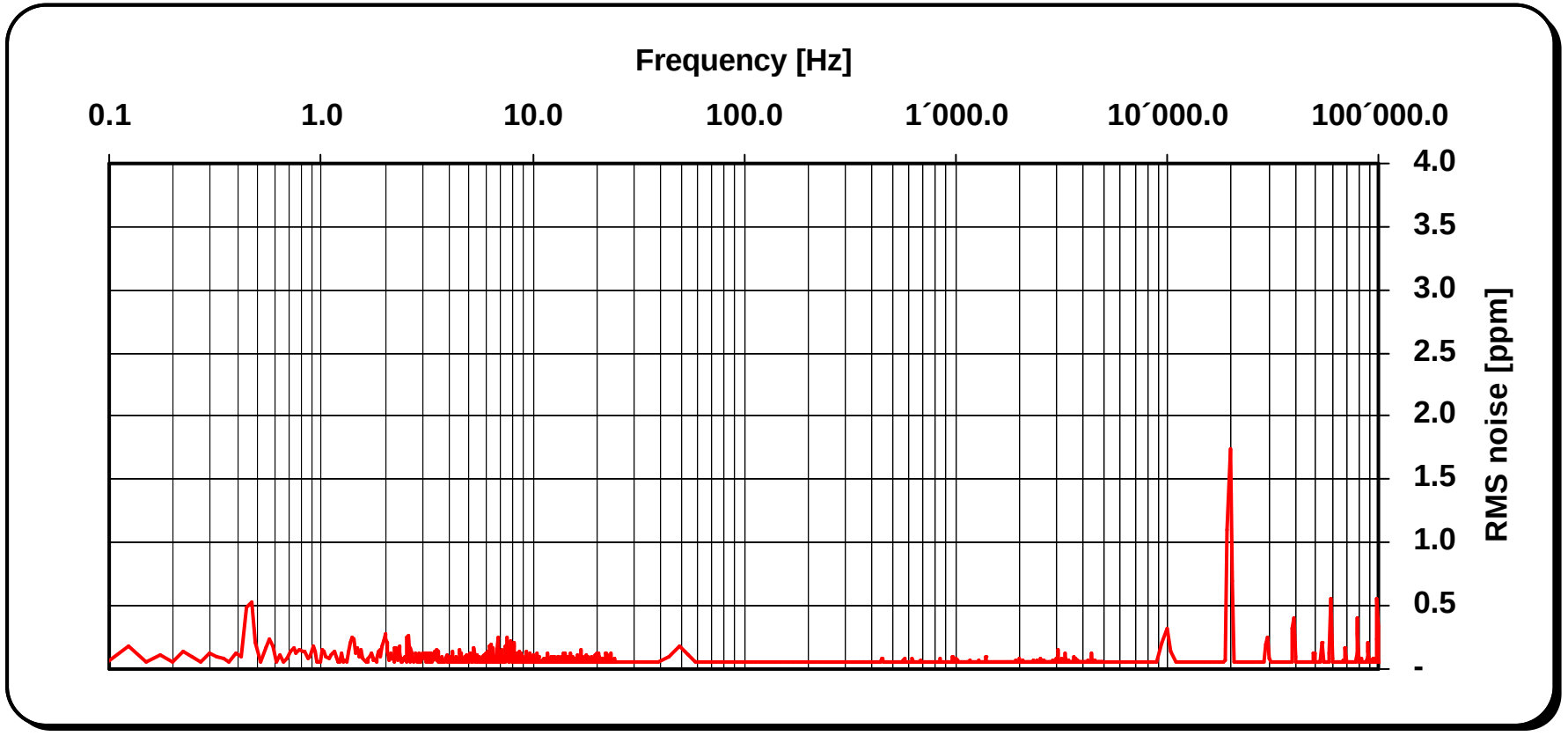
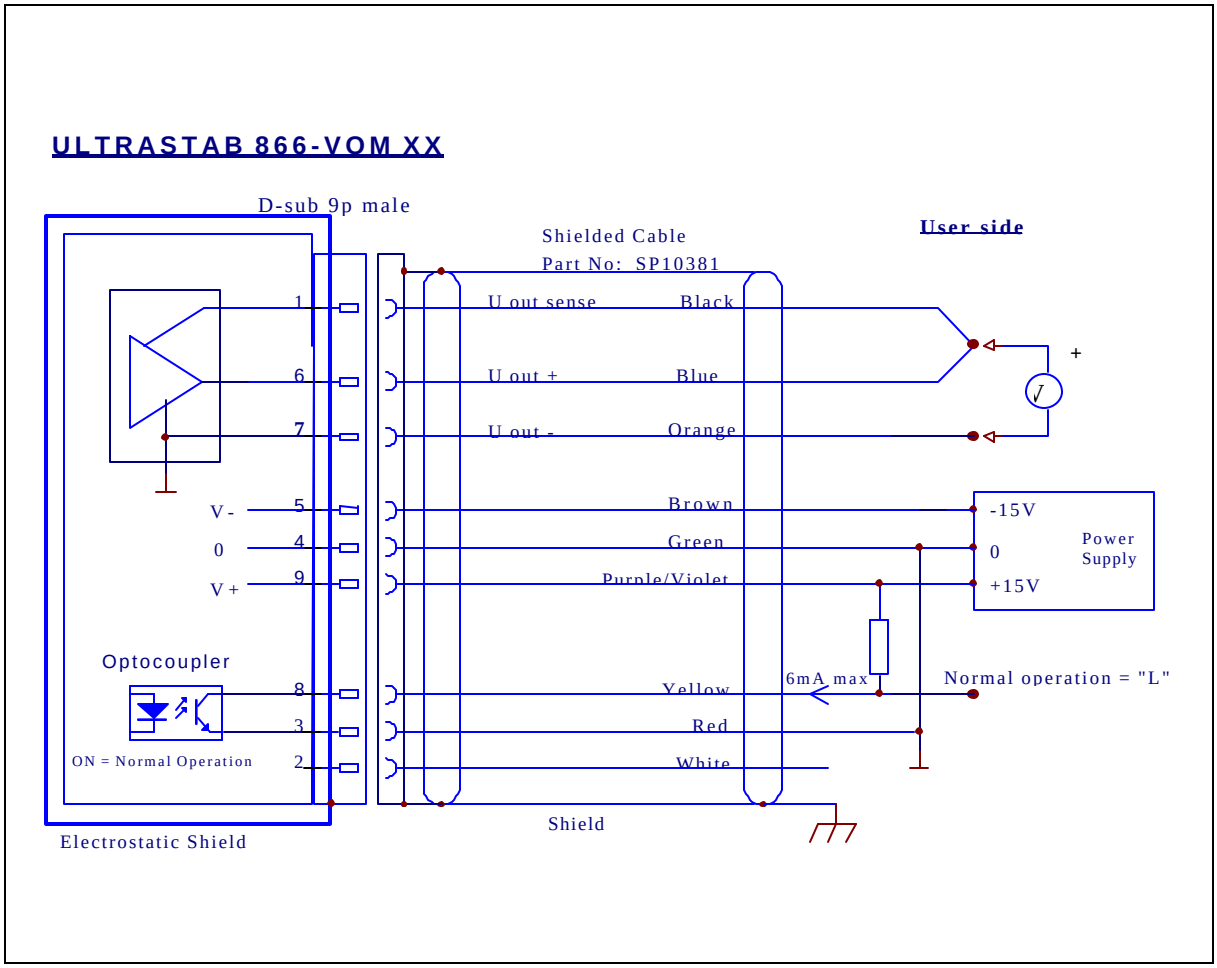
ULTRASTAB 866

Precission Current Transducer

Primary current:	0 – 600A
Temp. coefficient:	# 0.3 ppm
Resolution:	# 0.05 ppm
Linearity:	# 1 ppm
Ratio:	1500:1

Noise Spectrum





The Wiring diagram shows:

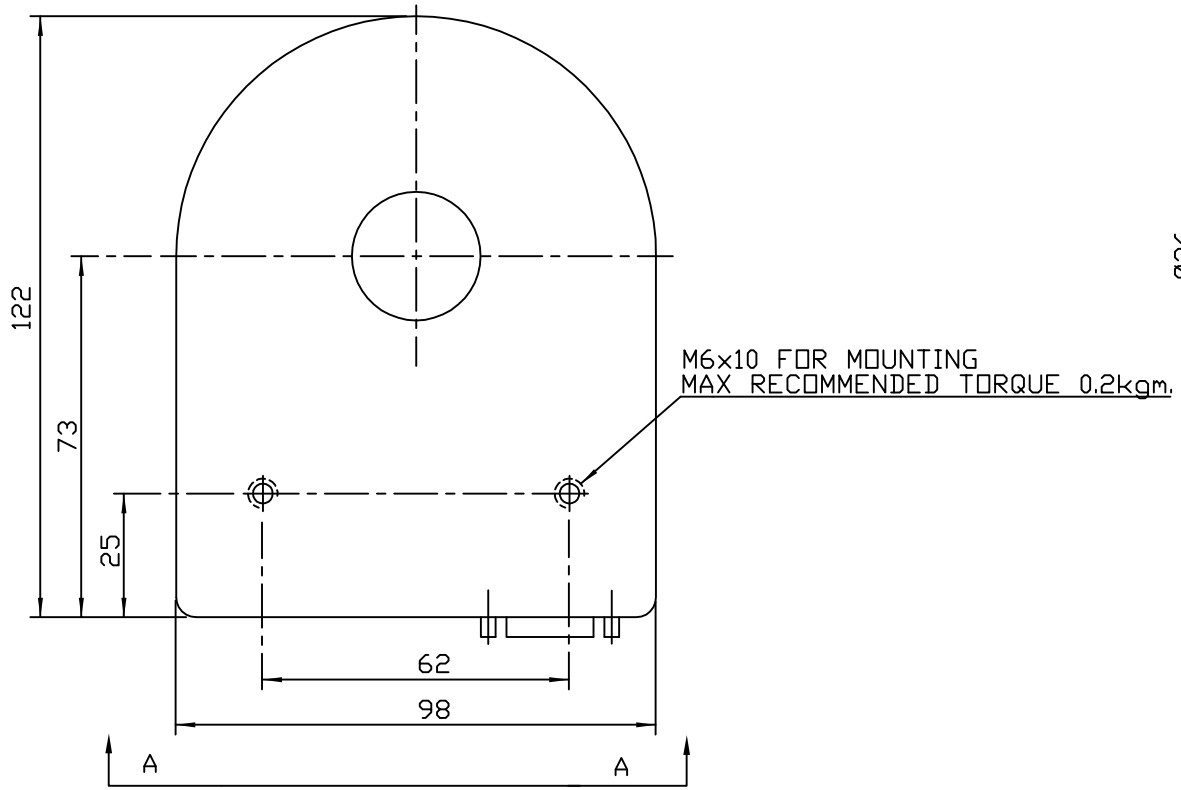
- Power connections
- Connection of voltage output
- Connection of opto-coupler output (status)

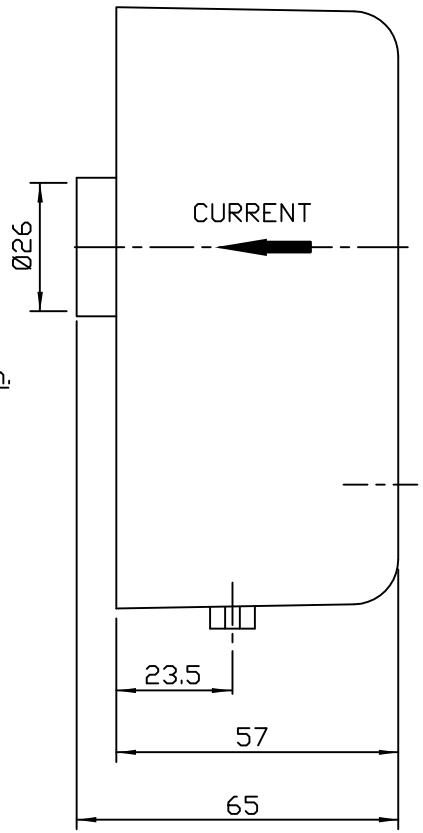
Re. Status: Normal Operation means:

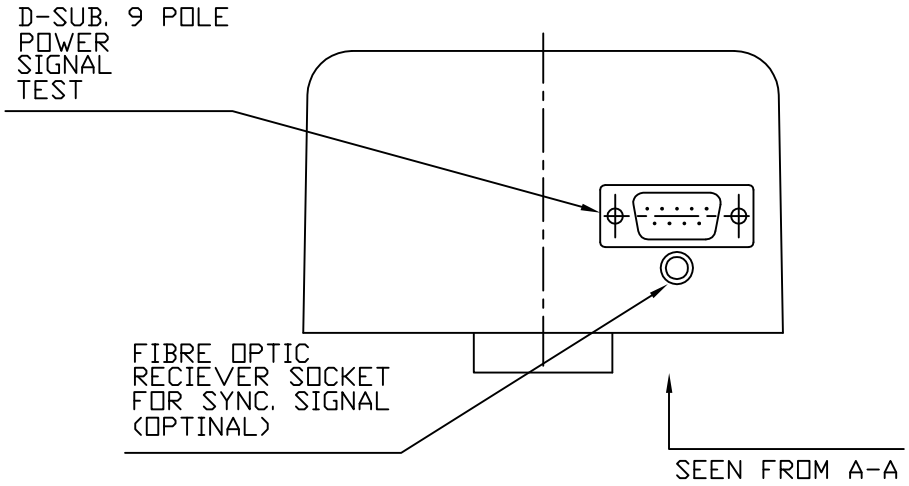
+/- 15V present

Zero detectors are working.

U out sense (pin 1) must be connected as shown for correct operation.







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SCALE: 1:1	MACHINING: -	
		DRAWN BY KP 11.03.97
		DESIGN APP. .
		PROD.APP. TS
		PROJ.ENGR. TS
CURRENT TRANSDUCER 150/600A ULTRASTAB 866		DWG.NO.: 88201G
DANFYSIK	CUSTOMER: . PROJECT NO. .	REVISION: G SHEET 1 OF 1
	FILE: .	DATE: MK 20.03.01 SIZE: A3

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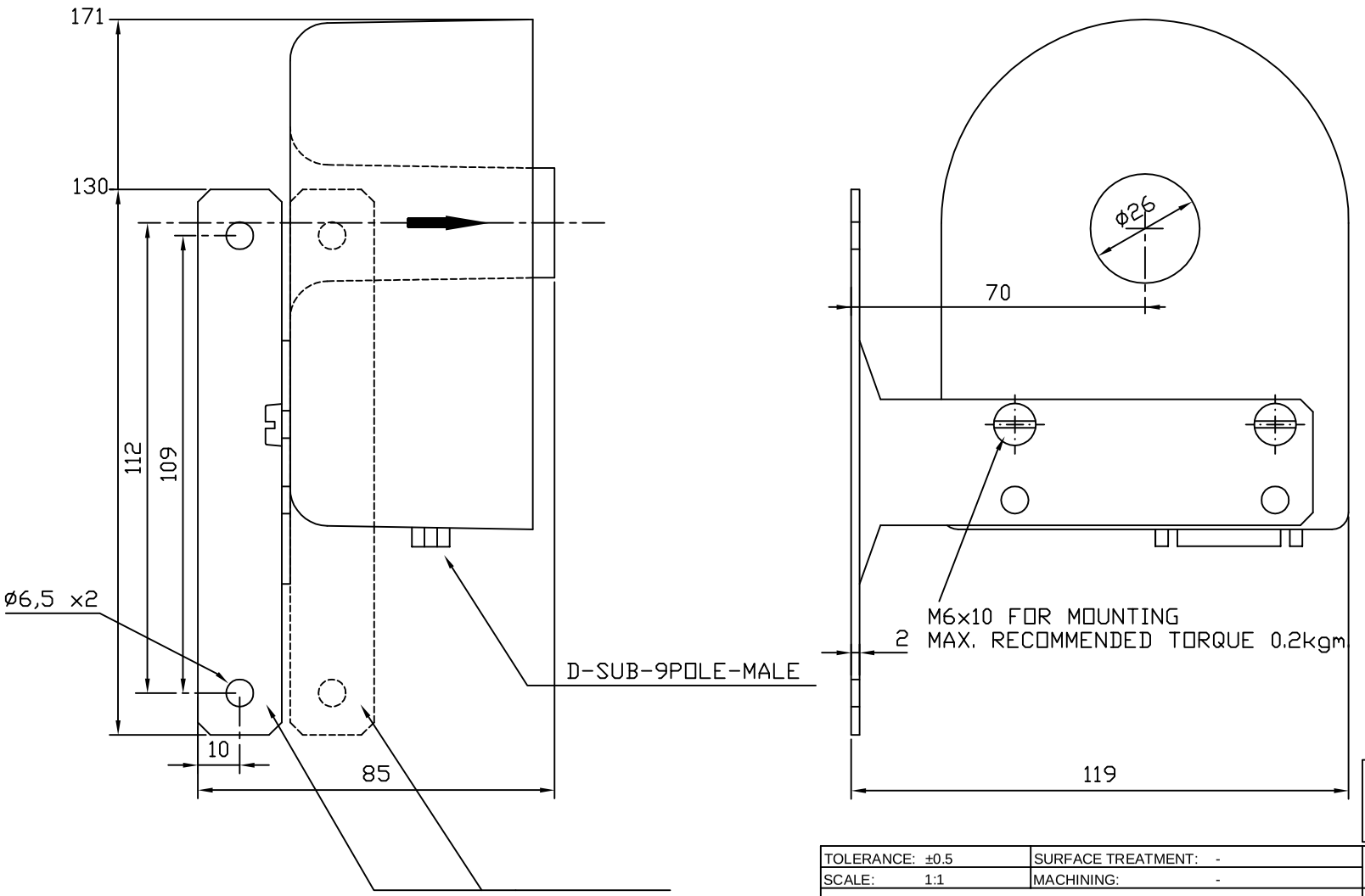
FIRST ANGLE PROJECTION



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TOLERANCE: ±0.5	SURFACE TREATMENT: -	MATERIAL: -
SCALE: 1:1	MACHINING: -	

TRANSDUCER TYPE 600
SHOWN WITH OPTIONAL
MOUNTING BRACKET
ULTRASTAB 866

DRAWN BY	KP 05.03.97
DESIGN APP.	.
PROD.APP.	TS
PROJ.ENGR.	TS
DWG.NO.:	88312D

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CUSTOMER: .	PROJECT NO. .	REVISION: D	SHEET 1 OF 1
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FIRST ANGLE PROJECTION